
MEMOIR

OF

JOSEPH JANVIER WOODWARD.

1833-1884.

BY

J. S. BILLINGS.

READ BEFORE THE NATIONAL ACADEMY, APRIL 22, 1885.

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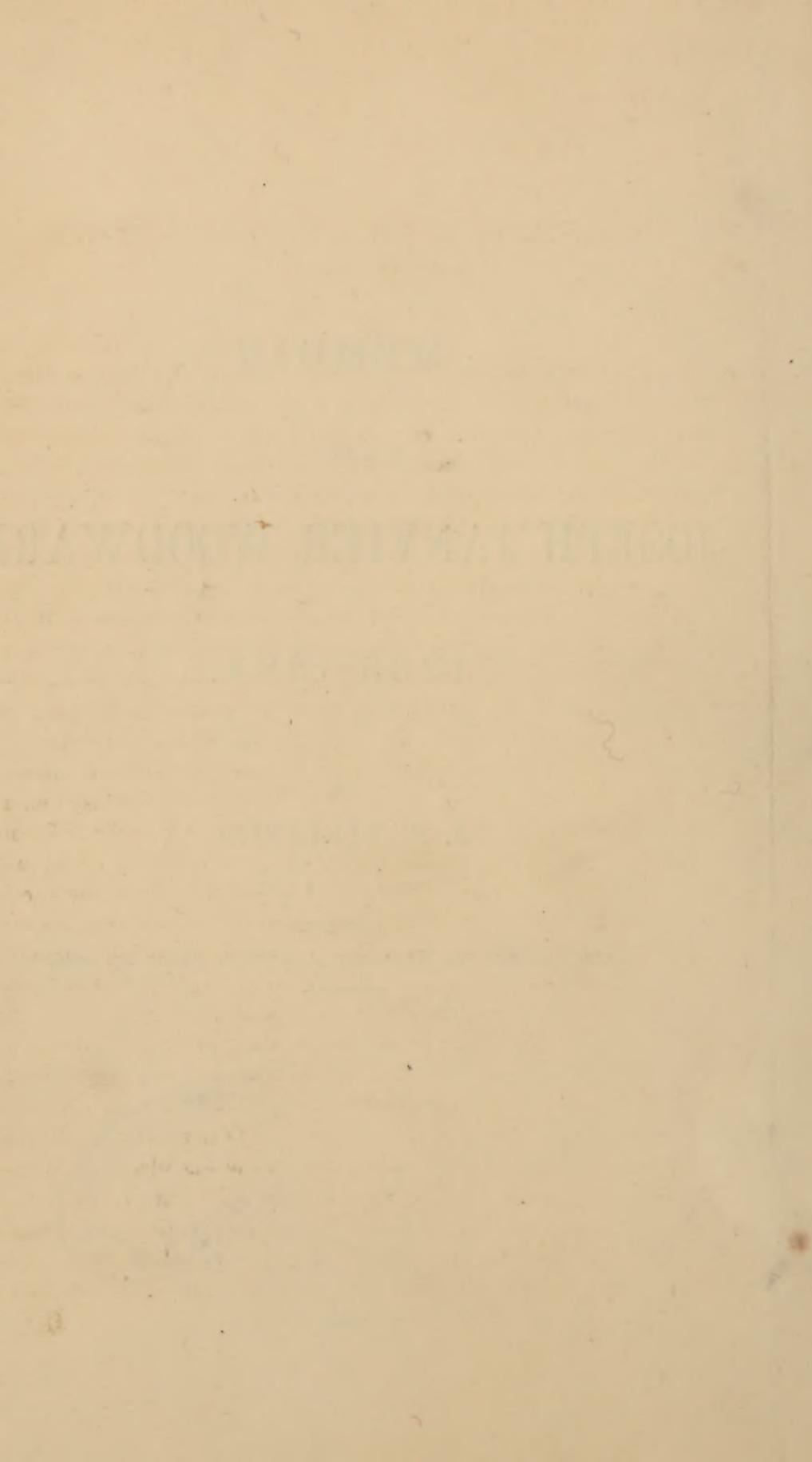
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BIOGRAPHICAL MEMOIR OF JOSEPH JANVIER WOODWARD.

Dr. JOSEPH JANVIER WOODWARD, Surgeon and Brevet Lieutenant Colonel U. S. Army, was born in Philadelphia October 30, 1833, and died near that city on the 17th of August, 1884. He was educated at the Philadelphia Central High School, from which he received the degree of A. B. in 1850, and that of A. M. in 1855, when he was honored with the position of valedictorian of his class.

He commenced the study of medicine in the office of Professor George B. Wood, attending lectures at the same time in the University of Pennsylvania, from which he received the degree of M. D. in 1853. He then opened an office for the practice of medicine in Philadelphia, gave private instruction in the use of the microscope and in pathological histology, and was a prominent member of the Pathological Society. At this time, in connection with the late Dr. Charles Bishop, he carried on a large quiz class in connection with the course of instruction in the University of Pennsylvania. He was demonstrator in operative surgery at the University of Pennsylvania; clinical surgical assistant to Professor H. H. Smith, and in charge of the surgical clinic of the University. At the outbreak of the war he at once offered his services to the Government and entered the army as assistant surgeon, his commission dating August 5, 1861. His first service was with the Second Artillery in the Army of the Potomac. May 19, 1862, he was assigned to duty in the Surgeon General's Office at Washington, in which position he remained until his death. In conjunction with Dr. John H. Brinton, of Philadelphia, he was assigned to the duty of collecting materials for a Medical and Surgical History of the War and for a Military Medical Museum. At the end of the war he was placed in charge of the pension division of the Surgeon General's Office, of the medical collection of the Army Medical Museum, and of the preparation of the medical portion of the Medical and Surgical History of the War. Soon after his assignment to duty in Washington his atten-

tion was attracted by the results of some experiments in photo-micrography made by Dr. William Thomson, now of Philadelphia, who was at that time in charge of one of the Washington hospitals, and appreciating the importance of perfecting this means of obtaining accurate representations of pathological histology he at once took the matter up, and with the assistance of Dr. Edward Curtis, U. S. Army, proceeded to improve the old and to devise new methods for this class of work. This led to the endeavor to secure improved objectives especially adapted to photo-micrographic purposes, and to the use of this process as a means of testing with scientific accuracy the relative merits of different objectives.

His publications of the results obtained by work in this direction gave a powerful stimulus to those engaged in the construction of microscopic objectives, and the great improvements which have been made in these instruments of research during the last twenty years have been due to a very considerable extent to his labors.

The essential features of the photo-micrographic processes used by him or under his direction at the Army Medical Museum were the use of a dark room so arranged that the operator was, so to speak, within his camera, the use of monochromatic light and of lenses specially adapted to it, and the great care and skill with which the dry and water immersion lenses of high power and the means of illumination were adjusted to produce the best possible results.

With the introduction of homogeneous immersion lenses much of the labor previously required became unnecessary, but the patience and skill with which Dr. Woodward adjusted his apparatus so as to produce the best possible results of which it was capable, were unequaled by any of the microscopists of his day.

His contributions to medical and scientific literature were numerous and extensive, as will be seen by the list appended to this sketch. The most important of these are the two volumes of the Medical and Surgical History of the War which he prepared, the reports on cholera and yellow fever in the Army of the United States published in 1867 and 1868, and the series of reports, with photographs, on the application of photo-micrography to test objects and to histological work. In 1873 he was elected a member of the National Academy of Sciences, in which he took a deep interest, and for which, as a member of various committees, he did much valuable work. As a scientific investigator and thinker his especial characteristics were the incessant labor which he devoted to the subjects

on which he was engaged and his desire to obtain his data at first hand as far as possible. His turn of mind was essentially that of a critic, and his first impulse on hearing of any alleged new fact or observation relating to matters in which he was interested was to doubt, and to attempt to verify it for himself. As a specimen of this class of work reference may be made to his numerous and interesting bibliographical notes contained in the medical volume of the second part of the *Medical and Surgical History of the War*. He was a clear and logical thinker and took great delight in communicating his views and opinions at all times.

In the circular announcing his death the Surgeon General says:

"With such a record it is needless to speak of his zeal, his ambition, or his devotion to his profession, and especially to the reputation of the corps of which he was so bright an ornament.

"Of a sensitive, highly strung, nervous organization, the confinement, anxiety, and labor to which he was subjected in his attendance upon the late President Garfield during his long illness proved too much for a mind and body already overstrained by incessant labor and precipitated the illness which finally terminated his life.

"At the time of his death Dr. Woodward was a member and ex-President of the American Medical Association, a member and ex-President of the Washington Philosophical Society, a member of the National Academy of Science, of the Association for the Advancement of Science, of the Academy of Natural Sciences of Philadelphia, and of the College of Physicians and Surgeons of Philadelphia. He was an honorary member of several American and foreign scientific, medical, and microscopical societies, and the recipient of many distinguished honors from learned bodies in this country and abroad."

LIST OF THE PUBLICATIONS OF DR. J. J. WOODWARD, U. S. ARMY.

ARRANGED IN ORDER OF DATE.

1858.

Report of cases treated at the Surgical Clinic of the University of Pennsylvania. Am. J. M. Sc., Phila., 1858, n. s. xxxv, 344.

Remarks upon the minute anatomy of three cases of cystocarcinoma. Am. J. M. Sc., Phila., 1858, n. s. xxxvi, 54.

1859.

Remarks on the anatomical diagnosis of cancer. Am. J. M. Sc., Phila., 1859, n. s., xxxvii, 67.

Contributions to the literature of carcinoma. 1. On transition forms between cancer and innocent growths. 2. Anatomy of a case of retrograde cancer. Am. J. M. Sc., Phila., 1859, n. s., xxxvii, 297.

Contributions to pathological histology. 1. On suppuration in cancerous growths. 2. Remarks on the anatomy of five cases of non-cancerous new formations of connective tissue. Am. J. M. Sc., Phila., 1859, n. s., xxxviii, 309.

Pathology and treatment of tuberculosis. Abstract of discussion of, before Phila. County M. Soc., October 12, 1859. Phila. M. and S. Reporter, Phila., 1859-60, iii, 159.

1860.

Contributions to pathological histology. 1. Remarks on errors in the anatomical diagnosis of cancer. 2. Remarks on a secondary cancer of the axilla. Am. J. M. Sc., Phila., 1860, n. s., xxxix, 331.

Seven cases of telangiectasis or vascular tumors. M. and S. Reporter, Phila., 1860, v, 307.

Four cases of cancer. M. and S. Reporter, Phila., 1860, v, 336.

Heart clot. Report of committee to Phila. County M. Soc. M. and S. Reporter, Phila., 1860-1, v, 399.

1863.

Report on the sickness and mortality in the U. S. Army for the year ending June 30, 1862. Am. M. Times, Phila., 1863, n. s., vi, p. 166.

Hospital gangrene (letter to Prof. Detmold). Am. M. Times, 1863, vi, 179.

The hospital steward's manual, etc. Phila., J. B. Lippincott & Co., 1863.

Outlines of the chief camp diseases of the United States armies, as observed during the present war. Phila., J. B. Lippincott & Co., 1863, xii, 364, 8vo;

also [Rev.] Am. J. M. Sc., Phila., 1864, n. s., xlviii, 159, and Am. M. T., Phila., 1864, viii, 33-47.

Circular No. 15, War Department, Surgeon General's Office. 8 pp., 8vo. Washington, September 8, 1863. Sickness and mortality of the army during the first year of the war, with six diagrams.

1865.

On the use of aniline in histological researches, with a method of investigating the histology of the human intestine, and remarks on some of the points to be observed in the study of the diseased intestine in camp fever and diarrhoea. Am. J. M. Sc., Phila., 1865, n. s., xlix, 106.

Circular No. 6 [with Dr. G. A. Otis, U. S. army]. War Department, Surgeon General's Office. 164 pp., 4to. Washington, November 1, 1865. Reports on the extent and nature of the materials available for the preparation of a medical and surgical history of the rebellion.

1866.

Report on the causes and pathology of pyæmia (septicæmia). Tr. Am. M. Ass., Phila., 1866, xvii, p. 171.

On photo-micrography with the highest powers, as practiced in the Army Medical Museum. Am. J. Sc., and Arts, N. Haven, 1866, n. s., xlvi, 189.

On microphotography with high powers. Quart. J. Micr. Sc., Lond., 1866, vi, 165.

1867.

Circular No. 5. War Department, Surgeon General's Office. xviii, 65 pp., 4to. Washington, May 4, 1867. Report on epidemic cholera in the army of the United States during the year 1866.

Catalogue of the medical section of the United States Army Medical Museum. 136 pp., 4to. Gov. Print. Office, 1867.

On monochromatic illumination. Quart. J. Micr. Sc., London, 1867, vii, 253.

1868.

Circular No. 1. War Department, Surgeon General's Office. 156 pp., 4to. Washington, June 10, 1868. Report on epidemic cholera and yellow fever in the army of the United States during the year 1867.

Remarks on the new nineteen-band test plate of Nobert. Quart. J. Micr. Sc., Lond., 1868, n. s., viii, 225.

Remarks on the nineteen-band test plate of Nobert. Am. J. Sc. and Arts, N. Haven, 1868, 2 s., xlvi, 352.

1869.

On the permanent preservation of histological preparations, as practiced at the Army Medical Museum, Washington, D. C. Am. J. M. Sc., Phila., 1869, n. s., lvii, 277.

Heliostat for photomicrography. Month. Micr. J., Lond., 1869, i, 29.

Abstract of lecture on photo-micrography applied to class demonstrations.

NATIONAL ACADEMY OF SCIENCES.

Dental Cosmos. Phila., 1869, xi, 397; repub. in Month. Micr. J., Lond., 1869, ii, 165.

Further remarks on the new nineteen-band test plate of Nobert and on immersion lenses. Month. Micr. J., Lond., 1869, ii, 289. [See notes in vol. iii, 1870, pp. 50 and 103, with regard to omission of diagram belonging to this article.]

Additional remarks on the nineteen-band test plate of Nobert. Am. J. Sc. and Arts, N. Haven, 1869, 2 s., xlviii, 169.

1870.

The Medical and Surgical History of the War of the Rebellion. Part I, vol. I, medical history, Washington, Gov. Print. Office, 1870, 4to, 726 pp.

Report of the committee on medical literature. Tr. Am. M. Ass., Phila., 1870, xxi, 107.

Report on the magnesium and electric lights, as applied to photo-micrography. Surgeon General's Office, January 5, 1870, 4to., 6 pp., 11 photographs; *also* reprint, Month. Micr. J., Lond., 1870, iii, 290; *also* Am. J. Sc. and Arts, N. Haven, 1870, 2 s., xliv, 294; *also* Brit. J. Photog., Lond., 1870, xvii, 270-282; *also* J. Franklin Inst., Phila., 1870, lix, 267.

Letter to Mr. Jabez Hogg with regard to Dr. Pigott's papers on the markings of certain test objects, particularly the Podura scale. Month. Micr. J., Lond., 1870, iii, 324.

Report on the oxy-calcium light as applied to photo-micrography. 4to., 3 pp., 2 photographs. Surgeon General's Office, 1870; *also* Reprint Am. J. Sc. and Arts, N. Haven, 1870, 2 s., i., 366; *also* Month. Micr. J., Lond. 1870, iv, 64.

The definition of Nobert's lines. Month. Micr. J., Lond., 1870, iv, 113.

Report on certain points connected with the histology of minute blood-vessels. 4to., 8 pp., 11 photographs. Surgeon General's Office, 1870, July 6th; *also* Reprint Month. Micr. J., Lond., 1870, iv, 205; *also* Quart. J. Micr. Sc., Lond., 1870, x, 380; *also* N. Y. M. Record, 1870-71, v, 313.

1871.

Memorandum on the amphibleura pellucida. 4to., 1 p., 2 photographs. Surgeon General's Office, 1871, Feb'y 1; *also* Reprint Am. J. Sc. and Arts, N. Haven, 1871, i, 345; *also* Month. Micr. J., London, 1871, vi, 43.

Memorandum on the surirella gemma. 4to., 1 p., 2 photographs. Surgeon General's Office, 1871, Feb'y 1; *also* Reprint Am. J. Sc. and Arts, N. Haven, 1871, i, 347; *also* Month. Micr. J., Lond., 1871, vi, 100.

On the structure of the podura scale and certain other test objects, and of their representation by photo-micrography. Month. Micr. J., London, 1871, v, 149.

Additional observations concerning the podura scale. Month. Micr. J., Lond., 1871, v, 245.

Memorandum on the test podura. 4to., 3 pp., 5 photographs. Surgeon General's Office, Feb'y 22, 1871.

On the use of the Noberts plate. Month. Micr. J., London, 1871, vi, 26.

Memorandum on pleurosigma angulatum and pleurosigma formosum. 4to., 4 pp., 8 photos. Surgeon General's Office, June 9, 1871.

Report on the pathological anatomy and histology of the respiratory organs in the pleuro-pneumonia of cattle, with 6 lithographs from photomicrographs. 22 pp., 4to. Washington, 1870; *also* in Rep. Commissioner Agricul. on the diseases of cattle in the United States. Gov. Print. Office, 1871.

Report on an improved method of photographing histological preparations by sunlight. 10 pp., 4to., 11 photos. Surgeon General's Office, 1871; *also* reprint Am. J. Sc. and Arts, N. Haven, 1871, 3 s., ii, 258; *also* Month. Mier. J., Lond., 1871, vi, 169; *also* Brit. J. Photog., Lond., 1871, xviii, 507.

Remarks on a case of supposed hermaphroditism. Am. J. M. Sc., Phila., 1871, n. s., lxii, 123.

Note on the resolution of amphibleura pellucida by a Tolle's immersion $\frac{1}{3}$ th. Month. Mier. J., Lond., 1871, vi, 150.

The note accompanying three photographs of degeeria domestica, as seen with Mr. Wenham's blackground illumination and a power of 1,000 diameters. Month. Mier. J., Lond., 1871, vi, 266.

Note on the angle of aperture of Tolle's immersion $\frac{1}{3}$ th. Month. Mier. J., Lond., 1871, vi, 290.

The Army Medical Museum at Washington. Lippincott's Mag., March, 1871, 233.

1872.

Microscopical memoranda for the use of practitioners of medicine. Lens, Chicago, 1872, i, 34, 93, 158, 223.

On the double markings of triceratium. Lens, Chicago, 1872, i, 100; *also*, Abs. Month. Mier. J., London, 1872, viii, 32.

Four letters to the Surgeon General accompanying photographs of the mosquito, certain parasites, the proboscides of certain flies, and miscellaneous photographs of insects and parts of insects, 8 pp., 4to., 35 photos. Surgeon General's Office, 1872, Jan. 5, 10, 15, 20.

Report on the minute anatomy of two cases of cancer. 10 pp., 4to., 2 photo-lithographs; Surgeon General's office, 1872, April 29; *also* reprint Month. Mier. J., Lond., 1872, viii, 109.

Note on Dr. Barnard's remarks on "the examination of Nobert's nineteenth band." Month. Mier. J., Lond., 1872, vii, 10.

Reply to Mr. Stodder, "B," and Mr. Edwin Bicknell. Letter to editor. Month. Mier. J., Lond., 1872, vii, 27.

Note on the resolution of amphibleura pellucida by certain objectives made by R. and J. Beck and by William Wales. Month. Mier. J., Lond., 1872, vii, 165.

On the use of monochromatic sunlight as an aid to high power definition. Am. Naturalist, Salem, 1872, vi, 454; *also* reprint Month. Mier. J., Lond., 1872, viii, 186.

Remarks on the desirability of reproducing photographs of scientific objects, and especially of magnified microscopical preparations in a permanent

form by some photo-mechanical method. *Abst. Bull. Phil. Soc., Wash., 1871-'4, i, 41.*

The use of amphibleura pellucida as a test object for high powers. *Am. Naturalist, Salem, 1872, vi, 193.*

Remarks on the Woodbury photo-relief process. *Abst. Bull. Phil. Soc., Washington, 1871-'4, i, 57.*

Remarks on the nomenclature of achromatic objectives for the compound microscope. *Am. J. Sc. and Arts, N. Haven, 1872, 3 s., iii, 406; also reprint Month. Mier. J., Lond., 1872, viii, 66; also Am. J. Mier., N. Y., 1881, vi, 77.*

Memorandum on the nineteen band test-plate of Nobert, 4 pp., 4to., 9 photos. *Surgeon General's Office, 1872, Sept. 29.*

Reply to further remarks on Tolle's $\frac{1}{3}$ th and Powell and Lealand's immersion $\frac{1}{6}$ th. *Month. Mier. J., Lond., 1872, viii, 158.*

Remarks on the resolution of the nineteenth band of Nobert's plate by certain objectives, especially by a new Tolle's immersion $\frac{1}{8}$ th. *Month. Mier. J., Lond., 1872, viii, 227.*

In reply to Dr. Lionel S. Beale. *Lens, Chicago, 1872, i, 208.*

Note on the frustulia saxonica as a test of high power definition. *Lens, Chicago, 1872, i, 233.*

Report as to the classification of diseases which should be adopted for the 9th census. *Rep. Ninth Census, 1872, ii, 5, Washington, Gov. Print. Office.*

1873.

Remarks on the aperture of object-glasses. *Month. Mier. J., Lond., 1873, ix, 268; also reprint, Lens, Chicago, 1873, ii, 145.*

.. Nobert's tests and Mr. Webb. Letter to the members of the Quekett Microscopical Club. *J. Quekett Mier. Club, Lond., 1872-'4, iii, 198; also reprint, Lens, Chicago, 1873, ii, 222.*

On immersion objectives of greater aptitude than corresponds to the maximum possible for dry objectives. *Month. Mier. J., Lond., 1873, x, 210.*

On Webb's test and other fine writing on glass. *Lens, Chicago, 1873, ii, 225.*

On the structure of cancerous tumors and the mode in which adjacent parts are invaded [1st Toner Lecture]. *Smithsonian Miscellaneous Collections, No. 266, 1873, 35 pp., 4to, 74 photo-micrographs; published by the Smithsonian Institution, Wash., 1873; also [rev.] Edinb. M. J., 1874, xx, 444; also Phila. M. Times, 1873-'4, iv, 301; also Atlanta M. and S. J., 1873-'4, xi, 660; also Am. J. M. Sc., Phila., 1874, n. s., lxviii, 219.*

1874.

On some photographs of microscopic writing. Letter to Mr. John E. Ingpen, F. R. M. S. *J. Quekett Mier. Club, Lond., 1872-'4, iii, 228.*

Further remarks on immersion apertures. *Month. Mier. J., Lond., 1874, xi, 119.*

Note on the microscopical slides of Dr. Otto Barth, illustration of pathological anatomy. Letter. *Med. Record, N. Y., 1874, ix, 381.*

Final remarks on immersion apertures (accompanied by the paper of R. Keith). *Month. Mier. J., Lond., 1874, xii, 125.*

Spontaneous rupture of the aorta in individuals whose aortic coats present but little evidence of disease. *Abstr. Tr. M. Soc. Dist. Columb., 1874, i, 54.*

1875.

On the similarity between the red blood corpuscles of man and those of certain other mammals, especially the dog; considered in connection with the diagnosis of bloodstains in criminal cases. *Am. J. M. Se., Phila., 1875, n. s., lxix, 151; also Abstr. Bull. Phil. Soc., Wash., 1874-'8, ii, 20; also reprint Month. Mier. J., 1875, xiii, 65.*

Note on the markings of *frustulia saxonica*. *Month. Mier. J., Lond., 1875, xiv, 274.* Notice of remarks on the same before *Phil. Soc. of Washington, Nov. 20, 1875; Bull. Phil. Soc. Wash., 1874-'8, ii, 60.*

Report of the Commission of the National Academy of Science appointed at the request of the Honorable Secretary of the Treasury to examine into the component parts of certain fabrics known in commerce as calf-hair goods (in conjunction with Dr. John LeConte). *Bull. Nat. Ass. Wool Manufacturers, vol. of Jan., 1874, to Dec., 1875; dated Washington, D. C., Sept. 17, 1875; also [Abstr.] Bull. Phil. Soc. Wash., 1874-'8, ii, 62; also [Abstr.] Month. Mier. J. Lond., 1876, xvi, 318.*

Noberts' test plate, in *Knight's American Mechanical Dictionary, vol. ii, 1531. New York, J. B. Ford & Co., 1875.*

1876.

Histology—Article, 37 columns, 33 wood cuts; Johnson's New Univ. Cyclopaedia, edited by F. A. P. Barnard and A. Guyot: New York, 1876, ii, 931-949.

Pamphlets issued in connection with the exhibit in the Hospital of the Medical Department U. S. Army, International Exhibition of 1876, viz., (No. 2) Description of the models of hospital cars, 10 pp., 8vo.; (No. 3) Description of the models of hospitals, 22 pp., 8vo.; (No. 4) Description of the models of hospital steam vessels, 12 pp., 8vo.; (No. 9) List of selected microscopical preparations from the Army Medical Museum, 7 pp., 8vo.; (No. 10) Description of the selected specimens from the Medical Section of the Army Medical Museum, 21 pp., 8vo.

Note on the markings of *navicula rhomboides*. *Month. Mier. J., Lond., 1876, xv, 209.*

On the markings of the body scale of the English gnat and the American mosquito. *Month. Mier. J., Lond., 1876, xv, 253.*

Mr. Brown's paper on Nobert's lines. *Month. Mier. J., Lond., 1876, xvi, 101.*

The application of photography to micrometry, with special reference to the micrometry of blood in criminal cases. *Am. M. Ass., Phila., 1876, xxvii, 303; also reprint Phila. M. Times, 1875-6, vi, 457; also Month. Mier. J., Lond., 1876, xvi, 144.*

Typho-malarial fever. Is it a special type of fever? Being remarks introductory to the discussion of the question in the Section of Medicine, International Medical Congress, Phila., 1876. Tr. Internat. M. Cong., Phila., 1876, 305. Reprinted (Gibson Bros., 44 pp., 8vo., Washington, D. C.)

The Medical Staff of the United States Army and its scientific work. An address to Internat. Med. Congress, Phila., 1876, 286. Reprinted, Gibson Bros., 28 pp., 8vo., Washington, D. C.

1877.

Dysentery and bacteria. An address delivered before the Society of the Alumni of the Medical Department of the University of Pennsylvania, March 10, 1877 (with the Proceedings of the Alumni Meeting of 1877). Phila., Collins, 1878.

A simple device for the illumination of balsam-mounted objects for examination with certain immersion objectives whose balsam angle is 90° or upwards. [Abstr.] Bull. Phil. Soc. Wash., 1874-8, ii, 126; *also* reprint Month. Mier. J., Lond., 1877, xviii, 61.

Brief rejoinder to some recent articles by Dr. Roberts Bartholow. Cincin. M. News, 1877, vi, 743.

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On the apertometer of Prof. E. Abbe, of Jena. [Abstr.] Bull. Phil. Soc. Wash., 1878, iii, 18.

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The oblique illuminator—an apparatus for obtaining oblique illumination at definite angles. Am. Quart. Mier. J., New York, 1879, i, 268; *also* [Abstr.] J. Roy. Mier. Soc., Lond., 1879, ii, 769.

Description of a new apertometer. Am. Quart. Mier. J., New York, 1879 i, 272; *also* [Abstr.] J. Roy. Mier. Soc., Lond., 1879, ii, 781.

Observations suggested by the study of amphipleura pellucida, mounted in Canada balsam, by lamplight and sunlight, with various objectives. J. Roy. Mier. Soc., Lond., 1879, ii, 663; *also* Reprint Am. J. Mier., New York, 1879, iv, 141.

Note on Abbe's experiment on pleurosigma angulatum. J. Roy. Mier. Soc., Lond., 1879, ii, 675; *also* Transl. [Rev.] Arch. f. Mikr. Anat., Bonn, 1880, ii, 260.

The Medical and Surgical History of the War of the Rebellion, part II, vol. I, medical history, being the second medical vol. Washington, Gov. Print. Office, pp. 869, 4to., 1879; 41 plates, 42 photo-relief cuts, 2 *fac-similes*.

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On a standard for micrometry. [Abstr.] Bull. Phil. Soc., Washington, 1878, iii, 22.

On the oil immersion objectives of Zeiss, and on convenient methods of obtaining oblique illumination for these and similar objectives. [Abstr.] Bull. Phil. Soc., Washington, 1878, iii, 25.

1880.

Memorandum on the amplifiers of Zeiss. Am. Month. Micr. J., 1880, i, 5; [Abstr.] J. Roy. Micr. Soc., Lond., 1879, ii, 943, 988; also Transl. Ztsch. f. Mikr., 1879-'80, ii, Heft v, vi, 169.

The size of the blood corpuscle. Med. Rec., New York, 1880, xvii, 131.

Remarks on the pathological histology of yellow fever. Prepared at the request of the National Board of Health. Printed as Supplement No. 4, Nat. B. of Health Bull., Wash., 1880, pathological histology of yellow fever.

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